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ABSTRACT

The Mental Retardation-Expert (MR-E) is a microcomputer based expert decision support system that provides practitioners with state of the art assistance in the treatment of aggressive, self injurious, and destructive behaviors displayed by individuals with mental retardation or developmental disabilities. This system, based on human experts and the current scientific literature, leads the practitioner through a functional assessment of the problem behaviors. Based on that analysis, the clinician is provided a variety of treatment suggestions, emphasizing the development of adaptive skills, which may be incorporated into the individualized treatment protocol. This paper focuses on the collection of decision support rules from human experts and on the assemblage of additional information, from the current behavioral treatment literature, to bolster and enhance those rules. (15 references) (Author)

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DECISION SUPPORT SYSTEM DEVELOPMENT FOR THE TREATMENT OF MALADAPTIVE BEHAVIORS

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Abstract

The Mental Retardation-Expert (MR-E) is a micro computer based expert decision support system that provides practitioners with state-of-the-art assistance in the treatment of aggressive, self-injurious, and destructive behaviors displayed by individuals with mental retardation or developmental disabilities. This system, based on human experts and the current scientific literature, leads the practitioner through a functional assessment of the problem behaviors. Based on that analysis, the clinician is provided a variety of treatment suggestions, emphasizing the development of adaptive skills, which may be incorporated into the individualized treatment protocol. This paper focuses on the collection of decision support rules from human experts and on the assemblage of additional information, from the current behavioral treatment literature, to bolster and enhance those rules.

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Decision Support System Development for the Treatment of Maladaptive Behaviors

In this age of community based treatment, the major stumbling block for those individuals with Mental Retardation or Developmental Disabilities who are unable to leave the institution is their maladaptive or disruptive behaviors (Harrman, 1984). Such behaviors include violence toward others, self abuse, property destruction, and other disruptive and socially unacceptable behaviors. These behaviors have been linked to initial referral to institutions (Campbell, Smith, & Wool, 1982) as well as to readmissions (Lakin, Hill, Hauber, Bruininks, & Heal, 1983), low rates of referral to community settings (Vitello, Atthowe, & Cadwell, 1983), and high rates of community placement failure (Intagliata & Willer, 1982; Jacobson & Schwartz, 1983). This problem takes on major proportions when it is realized that 53% to 84% of clients with mental retardation or developmental disabilities in public or community residential facilities exhibit moderate to severe behavioral problems (Calkins, Krantz, McGreevy, Neff, Griggs, & Intagliata, 1983; Eyman & Borthwick, 1980).

Numerous external factors work against clinicians' abilities to develop effective treatment programs for these severe behavior problems. First, high turnover rates for staff (Grossman, 1984; Munro, Duncan, & Seymour, 1983) mean that there are often few if any on site experts with extensive experience in the difficulties faced. New staff typically have limited training or experience writing treatment programs for these difficult problems. Trainers are typically assigned large case loads (Scheerenberger, 1982), due in part to funding reductions over the past years, that effectively spread their efforts over a larger number of clients than was previously the case. With increased pressures for direct service brought on by these high case loads and other external demands, trainers do not have the time necessary to thoroughly examine the literature to improve their programs and to refine or expand their areas of competence. Even when reviews of the treatment literature are attempted, the sheer volume of information on any particular problem may be overwhelming to the individual clinician (Bostwick, 1985) and that literature is typically not in a form conducive to its use in treatment protocals. As a result of these factors programs tend to become stilted and repetitive as trainers reuse old solutions to new problems rather than using possibly more efficacious forms of treatment based on the current scientific literature. To improve the treatment of individual clients, and to meet these various contextual pressures, a more efficient mechanism is needed to help integrate relevant treatment information and provide effective guidance concerning program design and development.

The Mental Retardation - Expert (MR-E, or "Murry") provides clinician users with state-of-the-art consultation and assistance concerning the development of behavioral treatment plans for individuals with severe behavioral difficulties (viz., aggression, self injurious behavior, and destructive behavior). MR-E is a sophisticated decision support system for the treatment of disruptive behaviors displayed by individuals with mental retardation or developmental disabilities. It is designed to assist trainers in the provision of effective treatment development services to the clients they serve, to ease the task of literature reviews relevant to the particular disruptive behavior, to teach relatively inexperienced clinicians functional assessment skills, and to provide positive program examples for their use and emulation.

The micro computer based MR-E contains four major components: knowledge of human experts, current scientific literature, basic behavioral treatment programs, and a comprehensive behavioral glossary. This presentation focuses on the creation and refinement of the first two of these components.

The collection and refinement of human expertize is a three step process. First, individuals expert in the appropriate area are interviewed concerning their consultation methods and procedures. Additionally, the expert is observed to ascertain the extent to which he or she actually follows the proposed model. Secondly, based on those discussions and observations, the basic decision support consultation model is developed. The model developed for MR-E involves leading a clinician user through a functional analysis of the behavioral difficulty and culminates in the specification of behavioral treatments designed specifically to address the

functions of the disruptive behavior. In the third step, the model is validated by other domain experts and actual users of the system.

Consultation: During the development of MR-E a single nationally recognized expert was used to generate the initial treatment rules. Based on written materials, provided by that expert, and verbatim transcripts of interviews between the expert and first author, various conceptual models were developed to represent the assessment and treatment information collected. After a number of iterations a rule based approach utilizing a functional assessment model was programmed. Currently MR-E contains some 187 if-then rules (See figure 1 for an example).

IF The *self-injurious behavior*[1] occurs when *she* is asked to perform a specific task or tasks.

AND *She* has the skills to perform the task or meet the task requirements

THEN *She* has the skills required to perform the aversive task or meet the task requirements.

Figure 1. Sample If-Then rule from MR-E.

If the clinician user answers "Yes" to the IF portion of this rule the THEN assertion will be made and MR-E will know that the individual has the skills necessary to perform the requested task. If the clinician responds "No" the negative will be asserted and MR-E will know that the necessary skills are not available.

Using its rules MR-E leads the clinician through a structured interview that assesses the client's behaviors, the situations in which they occur, and other relevant information. The result of this interview is a set of functional hypotheses concerning the individual's disruptive behaviors and a sequence of remedial recommendations. These assessments currently tap 21 different functional areas (See figure 2) These suggestions are critically evaluated by the clinician and, when appropriate, incorporated into their treatment protocols. MR-E suggestions are meant to provide clinicians with potentially beneficial treatment strategies based on the judgments of human experts and the current scientific literature. MR-E is not intended to dictate treatment decisions nor to replace clinicians.

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[1] *Italicized* words are specific to the individual client being assessed.

Minimal stimulation	Specific aversive requests
Specific aversive tasks	Aversive environment
Provoked by others	Models others behaviors
Settings are aversive	Is hungry
Is tired	Aroused by previous activity
Aroused by future activity	Certain times are cues
Aversive individuals	Aversive physical deprivation
Aversive physical condition	Anxiety/fear of specific events
Related to specific emotions	Related to general arousal
Part of a chain	Personal characteristics
Consequences	

Figure 2. Functional areas currently addressed in MR-E.

Literature: The literature component provides a basic scientific knowledge base for the users of MR-E, as well as supporting and augmenting the experts' rules. The source of this is a database, initially developed through literature searches and a perusal of new publications and enlarged by collecting relevant citations from previously identified articles, currently contains more than 3,000 articles addressing the diagnosis and treatment of severe behavior problems in individuals with mental retardation and or developmental disabilities. This literature serves as a basis for creating clinician focused literature reviews (e.g., Hile & Vatterott, 1991) designed to provide clinicians with the information necessary to conduct a specific treatment approach on a particular problem behavior. The electronic versions of these reviews, available to MR-E users on-line, provides additional information through annotations that, further specify details of the client, include an effectiveness index of the particular treatment program assessed, and a description of the actual treatment procedures sufficient to allow clinicians to create and implement similar treatment programs with their clients. These reviews and annotations provide clinicians with a rich source of ideas for the development and implememtation of behavioral treatment protocals for individuals with disruptive behaviors. MR-E also contains an extensive glossary of behavioral terms and procedures linked to the reviews and annotations through hypertext. This glossary, accessible from any point in the system, helps users understand the questions, recommendations, and descriptions used in MR-E.

MR-E's modules are integrated utilizing hypertext links. Hypertext is an electronic version of a reference or footnote. However, unlike a reference, hypertext provides instant access to an information thread about the particular word, phrase, or concept. These threads allow the reader to get only that detail of information they wish, skip those sections that are not relevant, and explore in greater detail their areas of interest. It allows them to digress, to explore, and to examine ancillary information, to engage in what is termed nonlinear thinking (Conklin, 1987). Additionally, these interconnections mean that any individual module may be used from within any other module. For example, while obtaining a consultation an unfamiliar term may be defined, via the glossary, or a relevant article may be examined, from the current scientific literature; or while reading a literature review an associated behavioral program may be located and examined. These various links enable users to access all the information they need to create effective behavioral interventions.

The knowledge of human experts and selected current scientific literature form the backbone of MR-E and provide clinicians with effective tools for developing and evaluating efficacious treatment plans for individual clients. Currently, a version of MR-E is being tested and evaluated at centers across the United States and in Canada. In this version, the knowledge of human experts, current scientific literature, and glossary of terms all contain substantial information. Based on the feedback provided by these users MR-E will be enhanced and modified to better meet the needs of its clinician users.

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